

seasons have less frost than others. Storm warnings were displayed frequently. Beginning February 24 special attention was given to the river conditions in northern California. Warnings were sent in ample time to river towns on the American, Yuba, and Feather rivers, also on the upper Sacramento. Warnings of high water for the reclaimed lands between the Sacramento and San Joaquin rivers were issued with the evening forecasts and distributed by the Associated Press. The work was of direct and positive value in saving lives and property. Much stock was removed from the lowlands in time.—*A. G. McAdie, Professor and District Forecaster.*

#### PORTLAND FORECAST DISTRICT.

The month of February was unusually stormy in this district. Four vessels were wrecked, as follows: Three-masted schooner *Emma Utter*, loaded with 360,000 feet of lumber, abandoned off Grays Harbor, February 11, came ashore in Barclay Sound, Vancouver Island, February 16; vessel and cargo total loss; crew saved. Schooner *Gem* sailed from San Francisco February 3, reported wrecked on Nehalem Beach, Oreg., February 16; vessel and cargo total loss; crew saved. Steam schooner *Fulton*, 300 tons, with 500,000 feet of lumber, ran out of fuel oil during storm of February 12 and was beached near Port Oxford, Oreg.; 1 man was drowned; the underwriters have strong hopes of saving this vessel. The three-masted schooner *Frank W. Howe*, loaded with railroad ties, was wrecked during a storm of February 22, a few miles north of the North Head, Wash., Weather Bureau station; 2 of the crew were lost; vessel and cargo a total loss. Warnings were issued in every instance well in advance of all severe storms, and the casualties that occurred were to vessels at sea beyond the reach of warnings. The work of the Weather Bureau vessel-reporting station at North Head, Wash., during the month has been very creditable. The first intimation of the disabled condition of the schooner *Frank W. Howe* was received from that station. The observer notified the life-saving crews in the neighborhood, and they were on the ground almost by the time the vessel reached the shore, and no time was lost in rescuing the crew. This station was also the means of saving the steam schooner *Grace Dollar* which became disabled during a severe storm and was drifting helplessly about. As soon as the observer sighted her he notified the tugs at Astoria, Oreg., one of which found and towed her to a safe anchorage after a very perilous trip over the bar at the mouth of the Columbia River. The disabled condition of the *Grace Dollar* was previously reported by the British Bark *Thistle*, but at this time the helpless vessel was too far out at sea for the tugs to locate her, and it is believed that it was the definite information received from the North Head Weather Bureau station which made the rescue of the vessels possible.

No cold waves occurred, nor were any cold-wave warnings issued.—*E. A. Beals, District Forecaster.*

#### RIVERS AND FLOODS.

The ice situation can be summarized as follows:

At the end of January, 1904, the Missouri River was frozen to near the Iowa-Missouri line, with 24 inches of ice at Wiliston, 29½ inches at Bismarck, 19 inches at Sioux City, and 13 inches at Omaha. One month later the only change noticeable was an increase, ranging from 3 to 6 inches, in the thickness of the ice. The Mississippi River on January 31 was frozen as far south as the mouth of the Illinois River, the thickness of the ice ranging from 26 inches at St. Paul to 16 inches at Hannibal. By the end of February there had been an increase of 11 inches at St. Paul and 1 inch at Hannibal. The river at Hannibal was open from the 7th to 17th, inclusive, and again on the 29th. At St. Louis heavy ice was persistent until February 25, when navigation was resumed. At Memphis the heaviest ice in many years was observed February 3 and 4, suspending navigation and endangering boats along the

river. The river was clear from the 5th until the end of the month, except from the 21st to 24th, inclusive. The Ohio River was free from gorges, but ice in greater or less quantities was constantly running until the 25th. There were some attempts at navigation, but nothing was done in a general way until February 24 and 25. The Kentucky River opened on February 24.

The great gorges in the Susquehanna River continued throughout the month. The conditions gradually became more threatening and serious, and at the end of the month the situation was the most dangerous of the entire winter. The persistent cold weather had solidified the gorges, and the only hope of averting greater danger and destruction than that which had already befallen the valley lay in the possibility that slowly moderating weather would permit the ice to go out gradually, reducing the loss to a minimum. The following report on the conditions during the month was prepared by Mr. E. R. Demain, official in charge, United States Weather Bureau office, Harrisburg, Pa.:

At the close of January the river was icebound at Huntingdon, Lockhaven, and Wilkesbarre, with the great gorges of ice in the main river near Bainbridge and in the North branch from Kipps Run to Berwick still intact.

On February 5 the weather map indicated rain and decidedly warmer weather for the Susquehanna Valley, and the following bulletin was, therefore, given the widest possible publication and distribution:

"River conditions are again becoming threatening. A storm, now approaching from the west, will cause a decided rise in the temperature and probably rain over the Susquehanna Valley to-night and on Sunday. Should the rainfall be heavy, which is likely, the ice in the river will probably break up and go out on a flood that may cause great damage to property and possibly endanger human life. Persons living on lowlands near the river, or those having live stock on river bottoms, are particularly cautioned to keep a close watch, as a sudden gorging of ice might cause their lands to become submerged. No one can positively predict what the outcome will be, but the public is warned that the possibilities of a damaging flood are considered great, and all should be prepared as far as possible to meet any danger that may arise."

On February 6 the following bulletin was published on the weather map: "The conditions continue favorable for an early break-up of the ice and a flood in the river, probably within forty-eight hours. Indications are for rain over the Susquehanna Valley to-night, the rain continuing Sunday."

The first reported break in the ice occurred at Lockhaven on the night of February 7, the ice gorging near Jersey Shore. The break in the Juniata occurred at Huntingdon on February 7, the river reaching a maximum stage of 9.0 feet during the night. At Wilkesbarre the ice began to break up at 5:15 a. m., February 8, and moved past the city until February 10, when it once more became stationary, owing to the formation of a gorge at Nanticoke, about 9 miles below. The water backed up till it reached a stage of 25.7 feet at 4 p. m. on February 9. Ice from Williamsport and points below on the West branch began to pass Selinsgrove on the night of February 8, and early on the following night the breaking of the gorge at Jersey Shore caused another heavy flow to begin. All this ice passed Harrisburg and lodged on the gorges below. On the afternoon of February 9 a section of the great gorge in the North branch moved, beginning a short distance above Berwick and stopping at Mifflinville. The ice in its progress moved the bridges at Berwick and Mifflinville from their piers. At 8 a. m., February 10, the river at Bloomsburg registered 29.5 feet, and at Catawissa 28.5 feet. Some previous high-water stages at Catawissa were as follows: March 18, 1865, 28.9 feet; March 3, 1902, 27.3 feet; and January 25, 1904, 29.3 feet, the latter stage the highest known.

A cold wave on the night of February 8 caused the West branch and the Juniata to begin to fall early on February 9, and on the morning of February 10 reports showed that the waters of all the streams of the system were receding. On account of the gorges, the waters fell very slowly from the great pools, and no material relief was afforded the flooded territory for several days, the severe weather intensifying the suffering of the people whose homes had been flooded. Low-lying farm lands, as well as the lower portions of towns and cities suffered severely, and the following statement relative to a single farm, taken from the Catawissa News Item of February 18, fairly represents the conditions obtaining on many farms along the river bottom.

"His farm buildings have been badly wrecked by the ice which covers the farm, and the house shows the effect of the flood. Several hundred bushels of potatoes in the cellar are a total loss, and the corn in the crib is frozen solid. The farmer has moved everything movable, and will not return to the farm until the floods are over. If the ice goes off with high water, every building on the place will go with it."

The Juniata at Huntingdon and the West branch at Lockhaven again

froze over on the night of February 12, and the river at Harrisburg closed at the pumping station of the city waterworks at 12:15 a. m., February 14, with 13.5 feet of water on the gage, the highest point at which the river here was ever known to become icebound. The gorge was caused by floating ice lodging on the gorges below Harrisburg, the ice backing up gradually, and covering the surface of the river to a depth of several feet. This gorge extended to Duncannon, about 18 miles above Harrisburg, by the night of February 16.

No material changes occurred in the general conditions during the remainder of the month. One cold period closely followed another, and the gorged ice became more and more solidified. The month closed with the people of the towns and lowlands along the river waiting for the general break-up, and hoping for such weather conditions as would remove the threatened danger with the least possible loss of property.

No danger line stages occurred, except those caused by the gorges in the North branch.

There were no changes of consequence in any of the New York or New England rivers, except an increase in the thickness of the ice. There were no ordinary, free-running floods during the month, except in northern California, where the continued heavy rains caused marked and rapid rises in all of the rivers. Warnings were issued from San Francisco on February 16, 22, 23, 24, and 27. At Red Bluff a stage of 28.2 feet was recorded on February 16, the highest stage on record with the exception of that of 29.5 feet on February 4, 1881. At

Marysville, on the Yuba River, a stage of 20 feet was reached at 3 a. m., February 25. This was 1 foot above the danger line, as well as the highest recorded stage. The highest stage reached at Sacramento was 27.9 feet on February 26. This was 2.9 feet above the danger line for the reclaimed lands south of the city, some of which were overflowed. It is difficult to estimate the total damage due to the floods. Many thousands of acres were overflowed, but it is doubtful if much damage was done to the crops, and there is an offset in the increased fertility due to alluvial deposits. The warnings issued were very accurate, and they afforded occasion for the expression of many words of commendation from the press and others interested, particularly along the upper Sacramento River.

The highest and lowest water, mean stage, and monthly range at 202 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, District Forecaster.*

## CLIMATE AND CROP SERVICE.

By Mr. JAMES BERRY, Chief of Climate and Crop Service Division.

The following summaries relating to the general weather and crop conditions during February are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau; they are based upon voluntary reports from meteorological observers and crop correspondents, of whom there are about 3000 and 14,000, respectively:

**Alabama.**—First two decades cool, wet, and unfavorable for plowing, except in northern counties, where rainfall was light; last decade dry, warm, and favorable, and farm work pushed; considerable land prepared for cotton and corn; a little corn planted; oats and wheat did well; acreage in oats about average; large acreage in Irish potatoes. Gardening well advanced; some early vegetables up. Peaches and plums blooming freely in southern and middle counties at close of month; strawberries promising.—*F. P. Chaffee.*

**Arizona.**—Though there was some cold weather early in February, the greater part of the month was warm. Drought conditions continued to prevail, and there was but little snow on the mountains at the end of the month. Crops did well where sufficient water was obtainable, but generally the month was unfavorable to agricultural interests. Droughty conditions greatly diminished the acreage of grain. Stock interests suffered and greater suffering was feared.—*M. E. Blystone.*

**Arkansas.**—There was an excess in temperature during the month, the last week being unusually warm. The precipitation was below normal, but was sufficient to put the ground in fine tilth. More than the usual amount of plowing was done, and considerable progress was made in sowing small grains. Stock wintered nicely and was generally thrifty. Fruit sustained no material injury from severe weather.—*Edward B. Richards.*

**California.**—The remarkably heavy rainfall in the central and northern sections was in a measure beneficial to all crops, but materially changed estimates of the yield of grain in portions of the San Joaquin and Sacramento valleys; many thousand acres of wheat and barley were flooded by high waters, and it is doubtful if any crops will be raised there. Elsewhere, and especially in the southern districts, the rain was of immense benefit and crop prospects are very fair.—*Alexander G. McAdie.*

**Colorado.**—The month was very favorable for stock, and losses were small, although in localities in the north-central and south-central counties and along the Divide the ranges were poor and stock-water scarce. Good pasturage was general throughout the eastern counties. There was little frost in the soil of the eastern slope, and some plowing and seeding were done, but dryness and high winds were unfavorable. The snowfall, while greater than during January, was much less than normal, and will not materially increase the supply of water for irrigation.—*F. H. Brandenburg.*

**Florida.**—The month was favorable for farm work, which was well advanced. Land was prepared for cotton and corn; some early planted corn in southern counties was above the ground. The bulk of the cane crop was planted and about the last of the orange crop shipped. Vegetable shipments were light. Citrus trees showed a heavy bloom and groves generally were in a splendid condition. Pineapples made a fair growth and the prospect for peaches was good. An increased acreage of cotton was indicated.—*A. J. Mitchell.*

**Georgia.**—The temperature was practically normal; a prominent feature was the absence of cold waves, but there were several periods of low

temperatures. The precipitation was below the normal except over a limited area in the southwest. Farm work was retarded by the prevailing weather. The outlook for wheat was favorable, but fall oats were inferior. The prospects for fruit were bright.—*J. B. Marbury.*

**Idaho.**—The month was unusually mild, permitting grass to make a good start and causing fruit and shade trees to bud in sheltered valleys. Precipitation was heavy, the average exceeding all previous records for February. Snow accumulated rapidly in the mountains, giving promise of an abundance of water for placer mining and irrigation. Winter wheat was reported in good condition. Stock wintered well.—*Edward L. Wells.*

**Illinois.**—The temperature was below normal. Low maxima rather than low minima were the characteristics. Precipitation was deficient and fell mostly in the form of snow or sleet. The ground was well covered until the latter part of month, when a general thaw ensued. The condition of wheat was unpromising. Some fields were reported badly damaged and others winter-killed. Much damp, soft corn remained in hand, and the scarcity of good seed corn is a matter of concern. Meadows and pastures were well preserved in northern and central districts. Peach buds were seriously damaged.—*Wm. G. Burns.*

**Indiana.**—Severe cold weather caused much apprehension as to the safety of wheat in the northern and greater portion of the central sections, but the high temperature and rain on the 28-29th cleared the fields of snow and ice, and examinations made after March 1 indicated better prospects for a crop than had been expected. In the southern section and a few southeast counties of the central section wheat was thin on the ground, short, and brown, and the prospects were poor.—*W. T. Blythe.*

**Iowa.**—There has been but one colder February in the past fifteen years, viz, in 1899. The precipitation was generally light, and there were no severe storms to interrupt travel or hinder the usual farm operations. Conditions were favorable for the care of stock, and for preparatory work for spring seeding. The limited area of fall wheat and rye was exposed to low temperature without snow covering and probably suffered some damage.—*John R. Sage.*

**Kansas.**—The dry moderate weather was quite favorable for outdoor work, and much plowing was done in the southern counties and some in the central. Wheat continued in fair condition in the southern and central counties, but was somewhat damaged in the northern by the cold dry weather. Oat sowing progressed in some of the southern counties. Cattle did well.—*T. B. Jennings.*

**Kentucky.**—Freezing weather during most of the month, with very little snow, and winter grasses suffered further damage. The prospect for wheat was apparently very poor. Some correspondents stated that the root was good, but the general opinion was that wheat was seriously damaged. As no warm weather occurred of sufficient duration to start the buds, fruit trees were believed to be in good condition. Tobacco beds were burned when weather permitted and a few beds were seeded. Stock wintered well, considering the cold weather.—*H. B. Hersey.*

**Louisiana.**—Favorable weather for outdoor work prevailed during the greater part of the month. Preparations for cotton planting were pushed vigorously in most sections, and, as a rule, were well advanced. The bulk of the land to be planted in corn was broken and some corn planted in the southern parishes. Stubble and fall plant cane did well; seed cane was in good condition and spring planting well advanced. Rice seeding had commenced. Spring oats were doing well. Truck gardens and berries were growing nicely.—*I. M. Cline.*

**Maryland and Delaware.**—The month was very cold and precipitation